

WHAT IS CLAIMED IS:

1. A method for forming a thin film on a semiconductor wafer comprising:

heating a process chamber to a steady-state processing temperature;

loading a semiconductor wafer into said process chamber;

introducing a reactive gas into said process chamber at a preselected pressure; and

unloading the semiconductor wafer from said process chamber at said processing temperature.

2. The method of Claim 1, wherein said processing temperature is between 800° C and 1200° C.

3. The method of Claim 1, wherein said processing temperature is between 200° C and 800° C.

4. The method of Claim 1, wherein said introducing of said reactive gas includes introducing an inert gas, wherein said molecular ratio between said reactive gas and said inert gas causes said reactive gas to be at said preselected pressure.

5. The method of Claim 4, wherein said preselected pressure of said reactive gas is between 0.1 Torr and 760 Torr.

6. The method of Claim 4, wherein said inert gases is taken from the group consisting of argon, helium and nitrogen.

5 7. The method of Claim 1, wherein said preselected pressure of said reactive gas is between 0.1 Torr and 760 Torr.

8. The method of Claim 1, wherein said preselected pressure comprises a partial pressure of said process chamber between about 0.1 Torr and  
10 760 Torr.

9. The method of Claim 1, wherein said reactive gas comprises a gas taken from the group consisting of  $O_2$ ,  $NH_3$ , TaETO, NO,  $N_2O$ , and  $H_2O$ .

15 10. The method of Claim 1, further comprising diluting said reactive gas with  $N_2$  to reduce said preselected pressure.

11. A method for forming a thin film on a semiconductor wafer comprising:

20 heating a process chamber to a steady-state processing temperature;

loading a semiconductor wafer into a process chamber, said process chamber being under vacuum pressure;

introducing a process gas under a pressure into said process chamber; and

removing said semiconductor wafer from said process chamber while said process chamber is under vacuum pressure.

12. The method of Claim 11, wherein said loading of a semiconductor wafer comprises loading a plurality of semiconductor wafers and removing of said semiconductor wafer comprises removing said plurality of semiconductor wafers.

13. The method of Claim 12, wherein said loading and removing of a plurality of wafers are accomplished using a robot arm comprising multiple end-  
10 effectors for grasping said plurality of wafers.

14. A method for forming a thin film on a semiconductor wafer comprising:

15 heating a process chamber to a steady state temperature;  
pulling a vacuum pressure in said chamber;  
loading at least one semiconductor wafer into a process chamber while said process chamber is under said vacuum pressure;  
introducing a process gas under pressure into said process chamber; and  
removing the at least one semiconductor wafer from said process chamber.

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15. The method of Claim 14, wherein said steady state temperature is a process temperature between about 800° C and 1200° C.

apparatus  
1, in situ

~~16. The method of Claim 14, wherein said vacuum pressure is maintained in the range of between 0.1 Torr and 760 Torr.~~

17. The method of Claim 14, wherein said process chamber is a  
5 resistively heated furnace.

18. The method of Claim 14, wherein said process gas is O<sub>2</sub>.

~~19. The method of Claim 14, further comprising pulling a vacuum  
10 pressure after said introducing of said process gas under pressure.~~

~~20. The method of Claim 14, wherein said removing is accomplished while said process chamber is under said vacuum pressure.~~

~~21. The method of Claim 14, wherein said loading of said at least one  
15 semiconductor wafer is accomplished in the absence of substantially all oxygen.~~